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## SPECIFICATION

### Hand grinder with an extraction device

5 The invention is based on a hand grinder according to the generic part of the main claim. Such a hand grinder has already become known from European Patent Application 0,138,278. A disadvantage in this known hand grinder is that a plurality of components, arranged one behind the other, is required in order to transmit the drive motion from the motor shaft to the grinding disk holder and to provide for the extraction air flow. This necessitates a relatively large overall height. In addition, the balancing of the masses effected with the fan wheel is not ideal here, because the balancing mass acts too far away from the unbalanced mass. A tilting moment therefore results from the action of the unbalanced mass and the balancing mass, which tilting movement has an unfavourable effect on the grinding work.

#### Advantages of the invention.

In contrast, the hand grinder according to the invention with the characterizing features of the main claim has the advantage of a simplified, compact construction. By combining the fan wheel having the balancing mass with the eccentric bearing for the drive of the grinding disk holder, parts are saved and the unbalanced mass and the balancing mass are moved closer to one another.

5 By the measures stated in the subclaims, advantageous further developments and improvements of the hand grinder specified in the main claim are possible. Particularly advantageous is the embodiment of the fan wheel with two separate rows of fan blades, of which one is used for extracting the dust and cooling the bearing of the eccentric drive, and the other is used for cooling the motor.

Two exemplary embodiments of the inventive subject-matter are shown in the drawing and are explained in greater detail in the description below.

*Figure 1* shows a section through a hand grinder according to the invention in a first embodiment, and

*Figure 2* shows a section through a hand grinder according to the invention in a second embodiment.

#### Description of the exemplary embodiments

In the first exemplary embodiment according to Fig. 1, a drive motor 4 with a fan wheel 5, which serves to cool the motor, a further fan wheel 6 and an eccentric drive 7 are accommodated in a housing 1 having a handle 2 and an auxiliary handle 3. A switch 8 with an operating grip 9 is arranged in the handle 2. The motor 4 is fixed in the motor housing by screws 10. Its rotor 11 is mounted on a motor shaft 12 which in turn is mounted in ball

bearings 13 and 14. Carbon brushes 15 are allocated to the collector 16 of the rotor 11 and are appropriately mounted in the housing 1. The fan wheel 5 is fixed non-rotationally on the motor shaft 12 by means of a key 17. A collar 18 of the motor shaft 12 and a lock washer 19 inserted into a recess of the motor shaft 12 secure the fan wheel 5 against axial displacement. The same lock washer 19 also serves as a bearing surface for the hub 20 of the fan wheel 6, which hub 20 is fixed on the motor shaft 12 by means of a threaded journal 21 on the end of the latter. A shoulder of this hub 20 locates the ball bearing 14 which forms the second mounting for the motor shaft. Accordingly, this ball bearing 14 is held on the other side in the housing 1. The hub 20 supports fan blades 22 and on these a ring 23 of varying thickness. Finally, the hub 20 has a stepped cylindrical recess 24, the longitudinal axis 25 of which is parallel to the longitudinal axis 26. The recess 24 therefore lies eccentrically to the motor shaft 12. It accommodates via two bearings 27 and 28 a pin 29 on which a grinding disk holder 30 is fixed. A hexagonal portion 31 of the pin 29 which fits into a corresponding recess in the grinding disk holder 30 is used for the rotational drive, while a screw 32 screwed into a tapped hole in the pin 29 holds the grinding disk holder 30 in position on the pin 29 via a washer 33. The grinding disk holder 30 has a soft lining 34 to which the actual grinding disk 35 is bonded or otherwise fixed, for example by means of touch-and-close fastener. A circle 36 drawn in a chain-dotted line indicates an outlet connection in the housing 1 through which the exhaust air can escape outside. The housing 1 consists of two identical halves which are held together by means of screwed connections 37. The screws 10 also serve as an additional connection for the two housing halves. The asymmetric thickened portion 38 of the ring 23 here serves as a balancing mass for the eccentrically mounted pin 29 with the grinding disk holder 30 supported by it. In addition, a balancing mass can be obtained by at least one of the fan blades 22 being thicker than the others in the area of the thickened portion 38 of the ring 23 and, diametrically opposite the thickened portion 38, by at least one of the fan blades 22 being omitted. Moreover, dynamic unbalance can be balanced by a part of the ring 23, which part is diametrically opposite the thickened portion 38, being axially displaced from the thickened portion 38. Openings 39 passing through the grinding disk 35, the lining 34 and the grinding disk holder 30 form the start of the extraction path, which is indicated by arrows 40.

Fig. 1 clearly shows how closely the unbalanced masses and the balancing masses have moved together. Moreover, Fig. 1 also clearly shows the effect which the fan wheel 6 has in

saving space and parts, which fan wheel 6 takes on three functions.

In the exemplary embodiment according to Fig. 2, a housing 41 with a handle 42 and an auxiliary handle 43 is equipped with motor 44. Its motor shaft 46, carrying a rotor 45 is mounted in the housing 41 via a ball bearing 47. The end of the motor shaft 46, which end is provided with a threaded journal 48, is screwed into a hub 49 of a fan wheel 50. A ball bearing 52 is inserted into an eccentric recess 51 of this hub 49. This ball bearing 52 locates a pin 53 which is axially secured by a lock washer 54. A screw 55 can be screwed into this pin 53, which screw 55 firmly connects a grinding disk holder 56 to the pin 53. The hub 49 forms a disk-shaped rib 57 concentric to the motor shaft 46. This rib 57 separates two rows of fan blades 58 and 59 which are supported by the hub 49. A similar circular rib 60 of the housing 41 penetrates into a corresponding clearance portion 61 between the rows 58 and 59 of fan blades. The exhaust-air connection indicated by a circle 62 overlaps both rows 58 and 59 of fan blades. A lid 63 screwed onto the end face of the hub 49 holds the ball bearing 52 in position in the recess 51. As in the example according to Fig. 1, here too the grinding disk holder 56 has a soft lining 64 with a grinding disk 65 fixed on it. Here, too, there are openings 66 through which the extraction air can be conveyed. A central opening 67 in the end wall of the housing 41, which end wall faces towards the grinding disk holder 56, determines the further part of the extraction air, which path is indicated by arrows 68. A housing wall 69 has openings 70 through which cool air flowing over the motor 44 can reach the fan wheel 50, here especially the row 58 of fan blades. This exemplary embodiment shows that, by means of a single fan wheel 50, the extraction-air flow can be produced via a row 59 of fan blades and the cooling-air flow from the motor 44 can be produced via a row 58 of fan blades. Both air flows reach the exhaust-air connection indicated in a chain-dotted line by the circle 62. Thus this embodiment of the inventive subject matter is even more compact than that according to Fig. 1 and therefore indicates a further improvement in the inventive subject matter. The balancing mass can be obtained in the same way by fan blades of various thickness or else by displacing a hub mass.

#### CLAIMS

1. Hand grinder with a device for extracting grinding dust, having an eccentric drive for the grinding disk holder and a fan wheel which has an unbalanced mass balancing the unbalance of the eccentric drive, characterized in that the fan wheel (6), with a concentric bore, is mounted onto the end of its motor shaft (12) and is provided with an eccentric

recess (24) for a pin (29) and the bearing arrangement (27, 28) of the latter, which pin (29) supports the grinding disk holder (30).

2. Hand grinder according to Claim 1, characterized in that the fan wheel (6) has an air-conducting ring (23) which is supported by its blades (22), forms a part of the end face of the fan wheel (6), which end face faces towards the grinding disk holder (30), and is of varying thickness (38) for balancing the masses.

3. Hand grinder according to Claim 1, characterized in that the fan wheel (6) for balancing the masses, has fan blades (22) of various thickness.

4. Hand grinder according to Claim 1, characterized in that, for balancing the masses, at least one fan blade (22) is missing from the fan wheel (6).

5. Hand grinder according to Claim 1, characterized in that the fan wheel (6) is designed as a combination of the features according to Claims 2 and 3 or 2 and 4 or 3 and 4 or 2, 3 and 4.

6. Hand grinder according to Claim 1, characterized in that the motor shaft (12) is mounted in the machine housing (1) via the fan wheel (6).

7. Hand grinder according to Claim 1, characterized in that the motor shaft (12) and the fan wheel (6) enclosing it are mounted in the machine housing (1) via a ball bearing (14).

8. Hand grinder according to Claim 1, characterized in that the pin (29) is mounted in the fan wheel (6) by means of a ball bearing (28) and a needle bearing (27).

8. Hand grinder according to Claim 1, characterized in that the fan wheel (6) is made of a material which is a good heat conductor.

10. Hand grinder according to Claim 1, characterized in that a fan wheel (50) is provided with two separate rows of fan blades (58, 59), of which one (59) is used for extracting the dust and cooling the pin bearing and the other (58) is used for cooling the motor.

11. Hand grinder according to Claim 10, characterized in that the two air flows produced by the separate rows of fan blades (58, 59) are directed to a common exhaust-air-opening (62) via corresponding air-conducting means (66, 67, 69).

12. Hand grinder according to Claim 2, characterized in that, at the air conducting ring (23), for dynamic balancing, its parts which are of various thickness and are located diametrically opposite one another are at an axial distance from one another.

13. A hand grinder substantially as herein described with reference to Fig. 1 or Fig. 2 of the accompanying drawings.



